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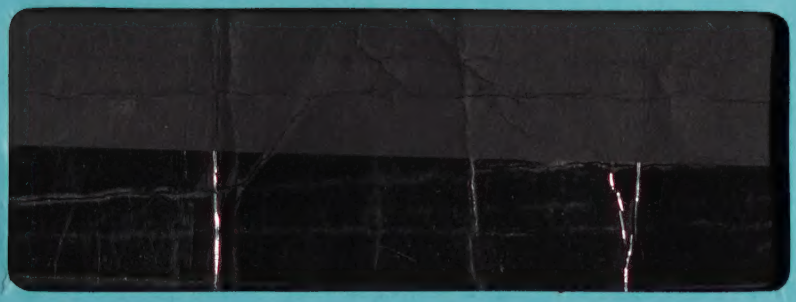

IWATSU

IWATSU ELECTRIC CO., LTD.

INSTRUCTION MANUAL

TYPE V-9F PLUG-IN UNIT

Iwatsu Electric Co., Ltd.

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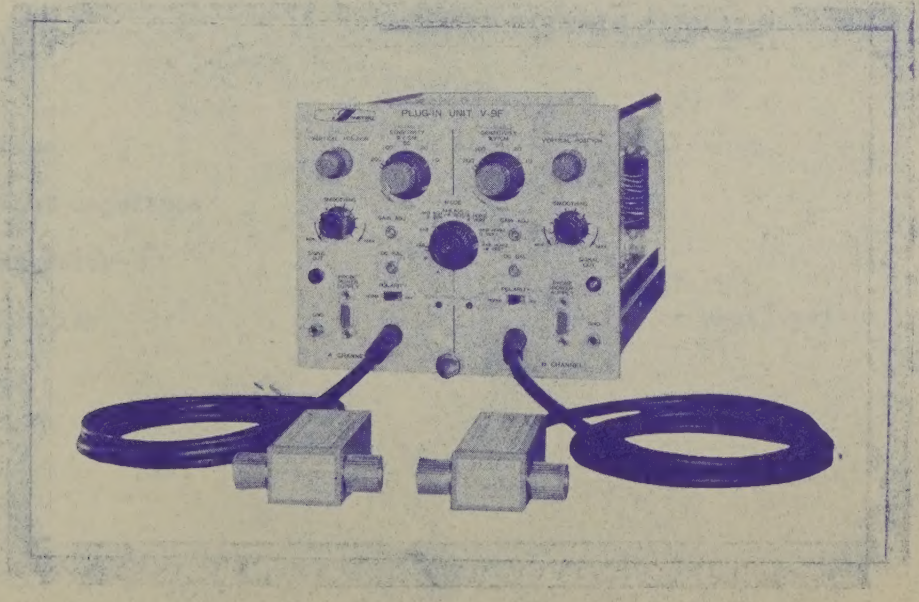


CHAPTER 1 GENERAL

The IWATSU TYPE V-9F PLUG-IN UNIT is a vertical sampling unit for use with a Type H-9Y or H-9W horizontal sampling unit and the SAS-5009B Samproscope. It has a frequency bandwidth of from DC to 18GHz, a risetime of approximately 20ps. Five calibrated deflection factors range from 10mV/cm to 200mV/cm. The use of a precision connector and feed-through system in the sampling head facilitates the measurement of reflection in coaxial cable and mismatching in connectors. Two signals can be observed simultaneously, and also observed the algebraic sum or difference of two waves, their lissajous pattern, etc. An automatic triggering is provided when used with a Type H-9W horizontal plug-in unit.

The Type V-9F is all solid state and provides high reliability.

1.1 Specifications

Frequency bandwidth	DC to 18GHz (-3dB)
Risetime	Approximately 20ps
Sensitivity	10, 20, 50, 100, and 200mV/cm, in five steps Each range can be continuously adjusted by means of VARIABLE (Approximately 4 to 200mV/cm)
Noise	Less than 15mV
Input impedance	50Ω
Connector	APC7
Polarity	Possible (positive or negative)

Mode operation	A only
	B only
	A and B (A and B dual trace)
	A + B (Sum or difference)
	A + B ACH. B BCH
	A + B ACH. -B BCH
	A HORZ. B VERT
	A + B HORZ. B VERT
	A + B HORZ. -B VERT
Time difference between A and B channels	Less than 10ps
SIGNAL OUT	Output voltage - Approximately 3 times the input signal
	Output impedance - 47kΩ
CF probe power	Provided

1.2 Construction

Exterior	Aluminum alloy chassis
	Front panel, White aluminum
Dimensions	210mm(W) x 175mm(H) x 307mm(D)
Weight (Including sampling head)	Approximately 3.5kg

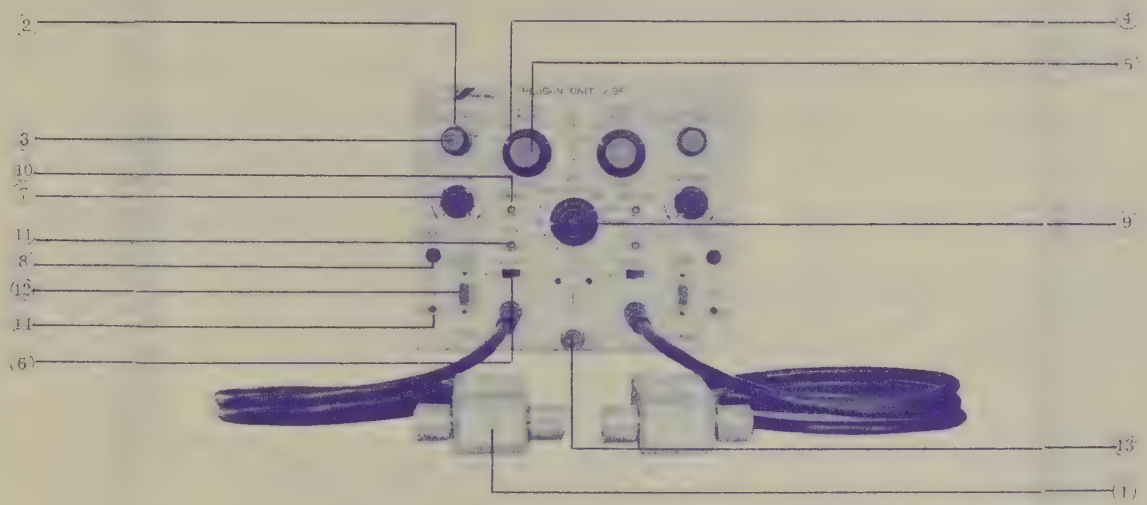
1.3 Accessories

Accessory case A-1	1	107mm(W) x 175mm(H) x 307mm(D) Weight 1.4kg
50Ω termination A-50M1	2	Connected to one of the sampling head connectors for the measurement of usual waveforms other than those described in 3.2.2.

Signal T A-501S1	1	Used for signal division and triggering signal attenuation to 1/10 without affecting its nature.
Adapter connector APC7-NJ	2	Used to connect an N-type connector plug to a BNC-type plug
Adapter connector NP-BNCJ	2	Used to connect an N-type jack to a BNC plug.
Holder	2	Used to attach the sampling head to the SAS-5009B sampling scope.

CHAPTER 2 CONTROLS AND CONNECTIONS

In this chapter, operating procedures of front-panel controls and connecting terminals of the Type V-9F plug-in unit will be described.



(1) Sampling head (both channels)

Since a feed-through system is employed, connect the accessory A-50M1 termination to either one of the connectors and the signal to be measureed to the other connector. (This applies to general measurement of signals and other types of measurement, refer to 3.2.2 Time Domain Reflectometry). Input impedance is 50 ohms.

(2) VERTICAL POSITION (3) VERNIER (Vertical position control and fine adjustment - both channels)

These knobs are used to adjust the vertical position. The trace is shifted up when these knobs are turned clockwise. The knob for channel A is for horizontal position adjustment when MODE is set to either (A HORIZ • B VERT), (A + B HORIZ • B VERT), or (A + B HORIZ • -B VERT). By rotating VERNIER knob, it is possible to control vertical position finely.

(4) SENSITIVITY (5) VARIABLE (Sensitivity switch and fine adjustment - both channels)

This switch selects the sensitivity for the input signal by 5 ranges between 10mV/cm ~ 200mV/cm.

When VARIABLE is set the calibrated position, the vertical display can be read directly in mV/cm.

VARIABLE increases the sensitivity up to 2.5 times when turned fully clockwise, and thus permits the waveform displayed to be adjusted to any arbitrary height.

(6) POLARITY (polarity switch - both channels)

This changes the polarity of the signals on the screen to positive or negative. It passes the signals with their polarity unchanged when set to NORM. and reverses their polarity when set to INV.

(7) SMOOTHING (both channels)

This reduces noise and jittering when turned clockwise.

When they are present in a signal and are not desired in the observed waveform, select smoothed response, and then when smoothing is applied, set DOTS/CM switch of the horizontal unit to as high a dot density as possible, SWEEP TIME/CM switch to as small a value as possible. Otherwise distortion at the rise of the waveform and incorrect amplitude will result. Normal response should be selected to view detailed waveforms and fast rise pulses.

(8) SIGNAL OUT (Signal output terminal)

The vertical signal output sampled by sampling pulses and composed of low-frequency components appears at this terminal. Output voltage is approximately 3 times the input signal.

(9) MODE (Mode switch - both channels)

Used to select one of nine modes.

- o A — Display of only channel A signal
- o B — Display of only channel B signal
- o A and B — Simultaneous display of both channel A and B signals
- o A + B — Display of the algebraic sum of channel A and B signals when POLARITY is set to NORM for both channels. Also permits display of A - B, -A +B, or -A -B when POLARITY of channel A and B is switched.
- o (A+B ACH • B BCH)

  Both the algebraic sum of channel A and B and channel B can be display when POLARITY is set to NORM for both channels.

  It also permits display of (-A +B, ACH • B BCH), (A - B ACH • -B BCH), or (-A -B ACH • -B BCH) when POLARITY of channel A and B is switched.
- o (A + B ACH • -B BCH)

  Display of both the algebraic sum of channel A and B and the inverted polarity signal of channel B simultaneously when POLARITY is set to NORM for both channels. It also permits the display of (A - B ACH • B BCH), (-A +B ACH • -B BCH), or (-A -B ACH • B BCH) when POLARITY of channel A and B is switched.
- o (A HORIZ • B VERT)

  The channel A signal controls horizontal deflection and channel B signal controls vertical deflection for X - Y operation (lissajous).
- o (A + B HORIZ • B VERT)

  The algebraic sum of the channel A and B signals controls

horizontal deflection and only the channel B signal controls vertical horizontal deflection when POLARITY is set to NORM for both channel A and B. This mode also permits the display of (A - B HORIZ · -B VERT), (-A +B HORIZ · B VERT), or (-A -B HORIZ · -B VERT) when POLARITY of channel A and B are switched.

This mode is useful for measuring V-I characteristic of diodes or B-H characteristic of magnetic materials and so on under high frequency.

o (A + B HORIZ · -B VERT)

The algebraic sum of the channel A and B signals controls horizontal deflection and the channel B signal controls vertical deflection in reverse polarity when POLARITY is set to NORM for both channel A and B. This mode also permits display of (A - B HORIZ · B VERT). (-A +B HORIZ · -B VERT), or (-A -B HORIZ · B VERT) when POLARITY of channel A and B is switched.

(10) GAIN ADJ (Sensitivity adjustment - both channels)

This is used to calibrate the sensitivity of the vertical axis to within 3% of the indicated values. For example, set the AMPLITUDE CALIBRATOR of the SAS-5009B Samproscope to 1V and the horizontal-plug-in unit to the free-running by turning the STABILITY knob clockwise.

Set the SENSITIVITY mV/CM switch of the V-9F to 200 (VARIABLE CALIB) and connect CAL OUT of the SAS-5009B to the sampling connector (with the other connector connected to the A-50M1 terminator) of the V-9F. A pair of traces or a rectangular waveform will appear on the CRT. If its amplitude is not 5cm, adjust it to 5cm by means of GAIN ADJ. screwdriver.

(11) DC BAL (Balance adjust - both channels)

This screwdriver adjustment permits a trace to remain fixed in the center of the CRT, when the vertical deflection factor is changed. Set the horizontal plug-in unit to the free-running by turning the STABILITY knob clockwise and connect the A-50M1 terminator to the sampling head of the V-9F.

If the trace shifts more than 5mm as SENSITIVITY mV/CM is changed from 10 through 200, conduct adjustment as follows.

1. Set SENSITIVITY mV/CM to 200 and bring the trace to the center of the screen by means of VERTICAL POSITION.
2. Set SENSITIVITY mV/CM to 100 and bring the trace to the center of the screen by means of VERNIER.
3. Return SENSITIVITY mV/CM to 200 and set the trace to the center of the screen with DC BAL.
4. Repeat adjustment 1 through 3 at each SENSITIVITY mV/CM step (100 thru 10) so that the trace shift stays within 5mm as SENSITIVITY mV/CM is changed from 200mV/CM through 10mV/CM.

(12) PROBE POWER SUPPLY (Power supply for the cathode-follower probe - both channels)

This is the power supply for the cathode-follower probe. The IWATSU Type CFS-2 may be used with high impedance.

(13) Plug-in unit clamp

This is used to lock the plug-in unit to the SAS-5009B Samproscope.

(14) GND

Ground terminal.

CHAPTER 3 PRECAUTIONS AND MEASUREMENTS

Since the IWATSU TYPE V-9F VERTICAL PLUG-IN UNIT uses a number of special semiconductors and coaxial parts, so the following notes should be taken.

- o Although the sampling heads employ a feed-through system, the A-50M1 50Ω terminator must be connected to one of the connectors and the signal to be measured to the other connector for all measurements other than in time domain reflectometry (refer to 3.2.3).
- o Be sure the SAS-5009B Samproscope power switch is turned off whenever removing or inserting the plug-in unit.
- o Do not attempt to loosen the screws in the coaxial parts and sampling heads. Otherwise performance may be impaired.
- o When removing printed circuit boards, insert them in the correct direction.
- o Do not apply an input voltage greater than 3Vp-p to the sampling heads, or damage to the instrument may result.

Also, the following consideration and care must be taken to preserve the fidelity of the signal when coupling the signal to the sampling head. Some of the precautions to observe in coupling the signal to this instrument are;

- o If the output of the device or system under test is other than 50 ohms. Use an impedance matching device so that mismatch effects will not degrade or distort the signal from the signal source.
- o For best results, use short cables or transmission air-lines, since long cables tend to attenuate the high frequency components of the signal.
- o Make sure that all connectors, attenuators, and cables are of proper impedance (50 ohms).

3.1 Basic operation

The Type V-9F vertical plug-in unit cannot be used alone but must be used in conjunction with the Type H-9W horizontal plug-in unit and Type SAS-5009B Samproscope. (Refer to the Instruction Manual for the basic operation of the Type H-9W and SAS-5009B.)

Type V-9F plug-in unit

Sampling heads	**With A-50M1 50Ω terminator connected**
MODE	A ~~and~~ & B
POSITION	Center
VERNIER	Center
SMOOTHING	MIN.
SENSITIVITY	200mV/CM
VARIABLE	CALIB

Type H-9W plug-in unit

TRIG	MANUAL
TRIG MODE	AC NORM (Plus or minus)
STABILITY	Clockwise
SWEEP	MAIN
HORIZ POSITION	Center
VERNIER	Center
MAIN SWEEP TIME/CM	5nSEC
VARIABLE	CAL
SCANNING	NORM
DOTS/CM	1000

Samproscope SAS-5009B

INTENSITY	Center
ASTIGMATISM	Center
FOCUS	Center
SCALE ILLUM	Center

The other controls may be at any arbitrary position.

After setting the controls to the above positions, make sure that the plug-in units are securely connected before turning the power switch ON. Each channel trace should appear on the screen of the CRT when the equipment starts to operate. If it does not, depress BEAM FINDER to obtain a trace or a spot. Position a spot in the center of the screen by means of HORIZONTAL POSITION or VERTICAL POSITION. Release BEAM FINDER. The trace will then appear on the CRT.

3.2 Measurements

This description applies to measurements with the Type V-9F combined with the Type H-9W horizontal plug-in unit. It is advisable to first read the instruction manuals for the SAS-5009B and H-9W.

3.2.1 Input signal

To observe usual waveforms, connect the A-50M1 50Ω terminator to the sampling head and use the 50Ω input impedance.

An APC7 precision connector is used for the sampling heads. Connect the signals to be observed to the sampling heads through this connector. The connector permits the observation of signals having a bandwidth of from dc up to 18GHz without any attenuation or reflections. If the output of the signals to be observed employs a N-type or BNC connector use the APC7-NJ or NP-BNCJ adapter to connect them to the APC7

connector. The attenuation and VSWR of these connectors are given in Figs. 3.1 and 3.2. Avoid using adapters NP-BNCJ for signals which contain comparatively high frequencies.

The accessory adapters have a cutoff frequency of

APC7-NJ	Approximately 18GHz
NP-BNCJ	Approximately 12GHz

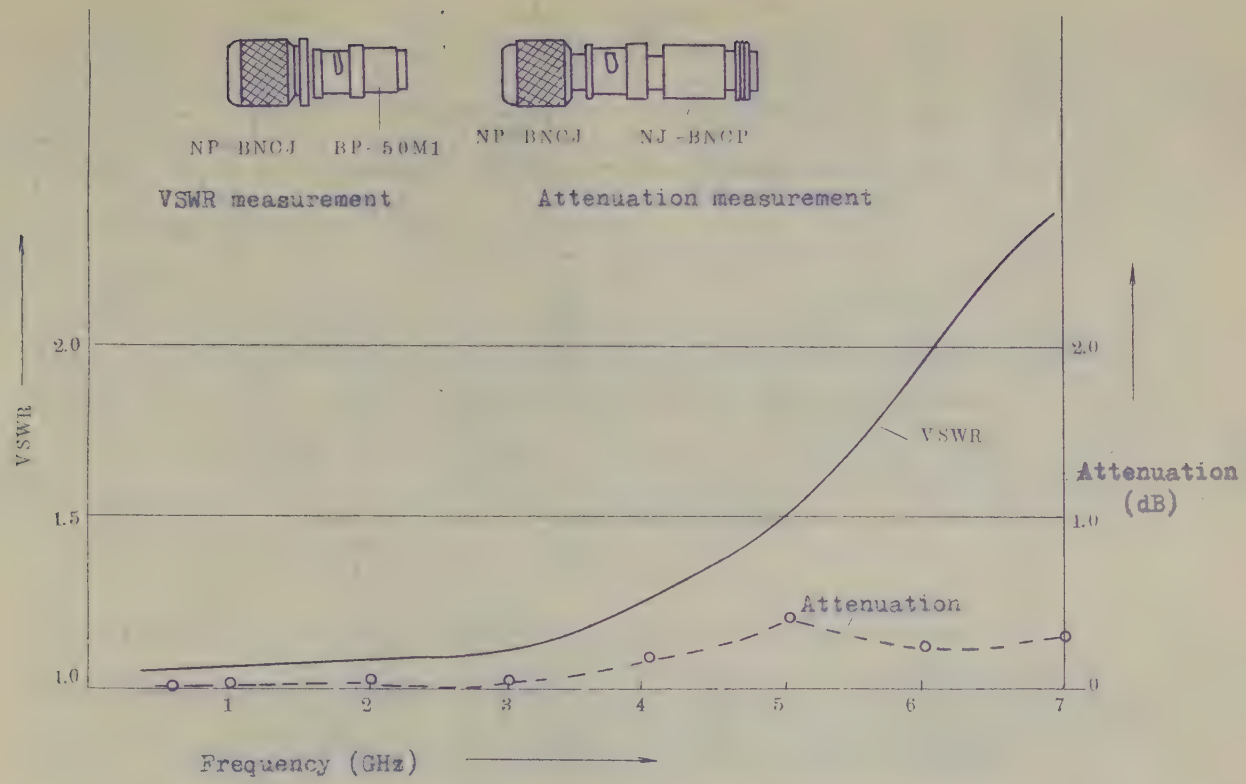


Fig. 3.1 VSWR was measured with a BP-50M1 50Ω terminator connected to the BNC connector and attenuation with the NJ-BNCP adapter connected.

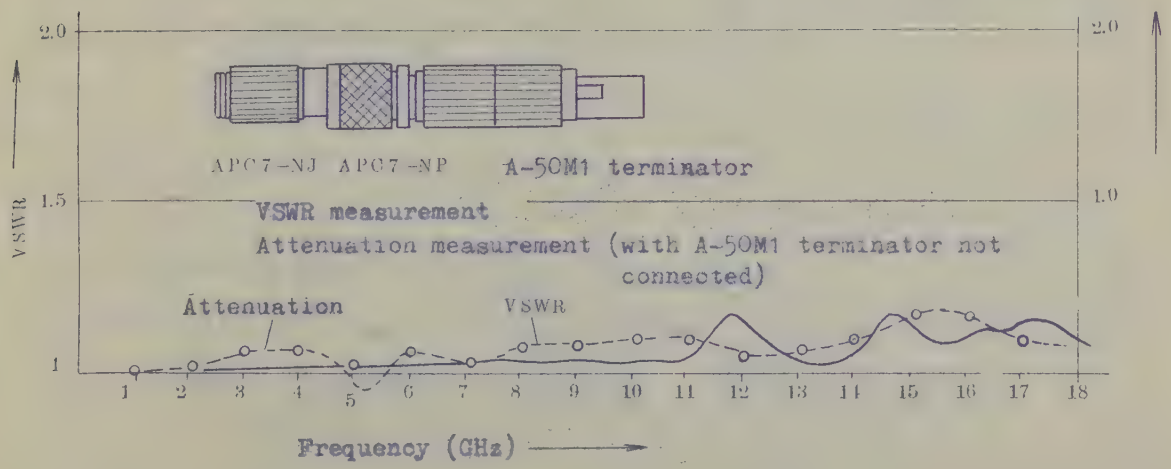


Fig. 3.2 Both VSWR and attenuation were measured with the APC7-NP adapter connected. For VSWR, a Type A-50M1 terminator was connected to the APC7-NP.

Ordinarily, high-impedance signals must be connected to the sampling head through an resistor for high frequency. A IWATSU CFS-2 probe, HZ probe, or current probe permits the connection of high-impedance signals to the sampling heads directly through the adapter.

o CFS probe

This probe has an input impedance of 10MΩ (dc) and a frequency response of up to 850MHz (-3dB). Seven types of attenuators ranging from 10:1 to 1000:1 and input capacitances of from 1.2pF to 4.0pF are provided. For details, refer to the CFS-2 probe catalog and instruction manual.

o HZ probe

The HZ-501A has an input impedance of 500Ω, input capacitance of 0.7pF (at a frequency of 200MHz), frequency response of up to 3.5GHz (-3dB), and attenuates signals to 1/10 to feed them to the sampling head.
The HZ-502A has an input impedance of 5kΩ, input capacitance of 0.6pF (at a frequency of 200MHz), frequency response of up to 1.7GHz (-3dB), and attenuates signals to 1/100 to feed them to the sampling heads.
The HZ probe is free from distortion under high voltages because it uses no nonlinear elements.
For details refer to the HZ probe catalog and instruction manual.

o CP-503 current probe

The CP-503 permits the observation of h-f currents and fast-rise pulses by simply clipping on them.
It has a sensitivity of 5mV/mA and a frequency response of from 50kHz to 700MHz. For details refer to the CP-503 current probe catalog and instruction manual.

3.2.2 Time domain reflectometry

It was stated eariler that in ordinary waveform observations, the A-50M1 50Ω terminator is connected to one of the sampling head

connectors of the V-9F.

However, the feed-through system also permits time domain reflectometry measurements in which the terminator is not connected to the heads.

H-9W or H-9Y horizontal plug-in unit

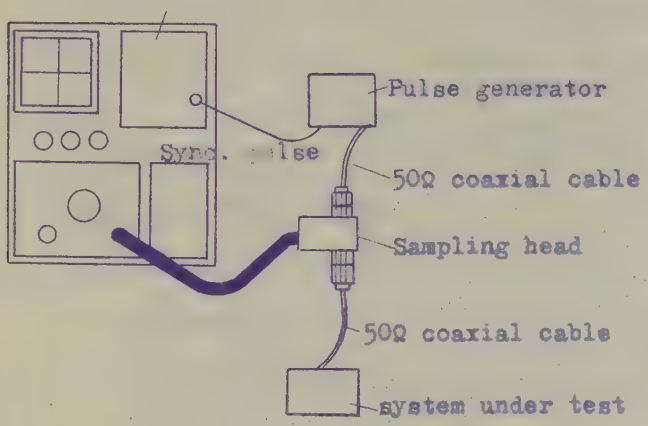


Fig. 3.3 Time domain reflectometry measurement

TDR (time demain reflectometry) method is to inject a very fast risetime pulse into the system under test from a 50 ohm impedance transmission line and to read off the characteristic of the system under test from the reflections sent back up the transmission line.

Requirements for TDR are a wide band sampling OSCILLOSCOPE and a very fast risetime pulse generator with a flat top.

Since the V-9F has a 20ps risetime, it is well suited for time domain reflectometry when used in conjunction with a very fast risetime pulse generator.

With the connections as illustrated in Fig. 3.3, on the CRT displays the waveform resulting from addition of the incident wave and the waves reflected at discontinuous points on the system under test, thus permitting the measurement of the nature and positions of such discontinuous points which cannot be found in conventional SWR measurements.

Moreover, by the use of a very fast risetime pulse generator, even extremely close discontinuities can be measured clearly, simply and accurately.

The output impedance of the pulse generator must be exactly 50Ω, or reflections between the pulse generator and the system under test will make it difficult

to determine reflections, impedance, etc. in the test point.

3.2.3 How to use smoothing

The SMOOTHING control reduces the effects of noise and jitter as it is turned clockwise, but simultaneously this control will degrade the displays on the CRT, so that this should be set to MIN. When viewing detailed waveforms and fast risetime pulses. However, when noise and jitter present in a signal are not desired in the observed waveform, response should be selected properly.

3.2.4 How to use MODES

- o Observing the signal in one channel

  The mode switch should be set to either A or B. Set it to A when the signals under observation are fed to the A channel.

- o Dual trace

  Set the MODE switch to A and B to simultaneously observe the inputs connected to channels A and B.

  The dual trace facilitates the observation of waveforms in respect to time or comparing their amplitude.

  When the MODE switch is set to (A + B ACH · B BCH) or (A + B ACH · -B BCH), the algebraic sum (or difference) of channel A and B signal and channel B signal (or in reverse polarity) can be simultaneously observed.

- o Observing the algebraic sum or difference of both channel signals

  Set MODE to A + B

  The measurement of the rectification characteristics of a diode is shown as an example in Fig. 3.5.

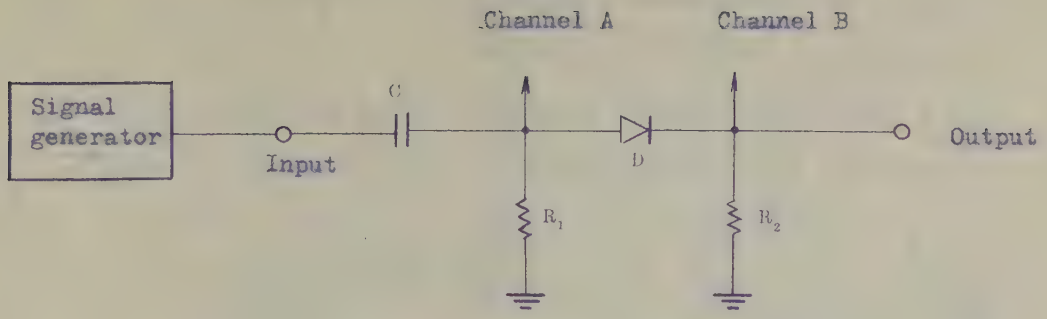


Fig. 3.5 Measurement of diode rectification characteristics

The oscilloscope will display the current waveform produced by the diode when MODE is set to B and the voltage waveform when it is set to A + B and POLARITY is set to NORM for channel A, INV. for channel B.

o In A-HORIZ · B-VERT mode

The oscilloscope will operate in the X-Y mode when the MODE switch is set to the A-HORIZ · B-VERT mode.

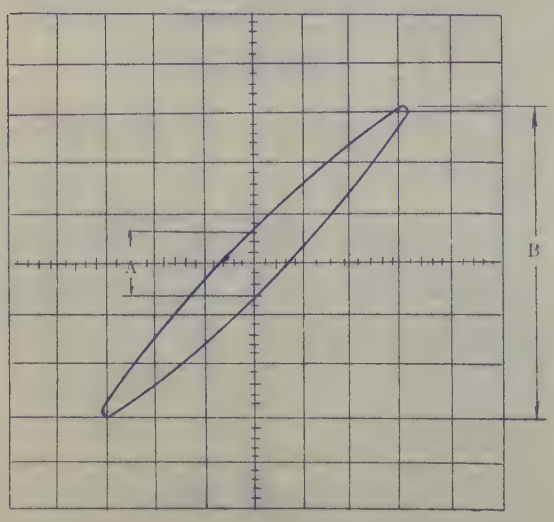


Fig.6

The channel A signal deflects the horizontal axis and the channel B signal the vertical axis.

Fig. 3.6 shows the measurement of phase difference by means of a lissajous waveform drawn from a sinewave.

o A + B -HORIZ • B-VERT, A + B -HORIZ • -B-VERT

These modes are useful for the observation of the voltage-current characteristics of semiconductors at high frequencies. In these modes, the algebraic sum or difference of the channel A and B signals deflects the horizontal axis, with the vertical axis deflected only by the channel B signal. Observation of the voltage-current characteristics of a diode will be presented as an example of this type of measurement.

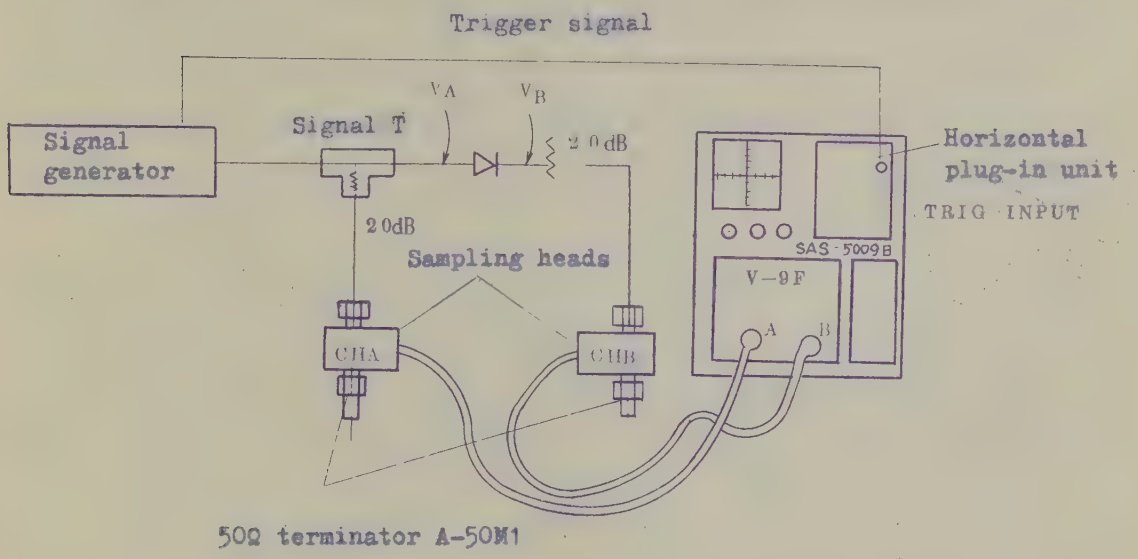
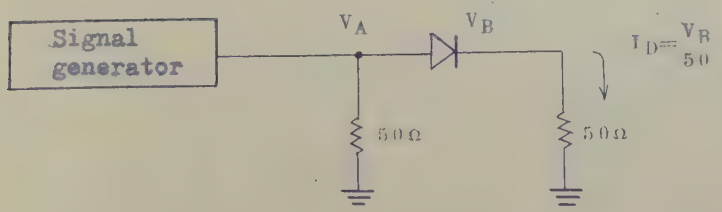


Fig. 3.7 Voltage-current characteristics of a diode at high frequencies



Voltage across diode $V_A - V_B$

Current through the diode $\frac{V_B}{50}$

Fig. 3.8 Equivalent circuit of Fig. 3.7

Since a 20dB attenuator is connected to the CH A and CH B sampling heads, the voltages applied to the sampling heads are $V_A/10$ and $V_B/10$, respectively. In Fig. 3.7 the MODE switch is set to A + B -HORIZ • B -VERT., POLARITY to NORM for channel A and INV for channel B for observation of the voltage-current characteirstics of the diode, the voltage is displayed on the horizontal axis and the current on the vertical axis.

Usually it is difficult to accurately measure the instantaneous values of V_D (voltage across the diode) because of the distorted waveform of VB, but the above method solves $V_D = V_A - V_B$ electrically and easily draws the voltage-current characteristic curve of the diode at high frequency.

PARTS LIST (V-9F)

PARTS LIST (V-9F)

Parts Ordering Information

Replacement parts will be available from Iwatsu factory or through Iwatsu representative. Make sure to check the detailed specified value and tolerance in this list before any replacement.

When you place order for replacement, it is requested to furnish us scope model number and serial number; and relative circuit number and parts code number.

Abbreviations;

Cer	Ceramic
EPC	Electrolystic paper or metal cased
EPT	Electrolytic paper or metal tubuler
Mp	Metallized paper
Var	Variable
EPT	Electoytic paper or metal tubular
WW	Wire-wound
Prec.	Precision

Note; For a tolerance

Resistors are fixed, ±2% unless otherwise indicated.
Capacitors are ±20% unless otherwise indicated.
All electrolytic capacitors are -10%, +150%.

Manufacture;

NEC:	Nippon Electric Company Limited
Toshiba :	Tokyo Shibaura Electric Co., Ltd.
Hitachi :	Hitachi Ltd.
INSC :	International Semi-conductor
Fairchild :	Fairchild Semi-conductor
NS :	National Semi-conductor Ltd.

(FS-) is a product schematic number in Iwatsu.

MAIN FRAME

Circuit No.	Description			Iwatsu Cord No.
- Capacitors -				
C3, 13	0.001μ	50V	Polyester Film	741302400
C4, 14	0.0022μ	50V	Polyester Film	741302550
C5, 15	0.0047μ	50V	Polyester Film	741302640
C6, 16, 108, 111	0.01μ	50V	Polyester Film	741302430
C104	10P	500V	Ceramic	740500430
C102, 103	22P	500V	Ceramic	740500490
C101	100P	500V	Ceramic	740500690
C107	0.01μ	50V	Ceramic	740600340
C109, 110, 113, 114	0.01μ	50V	Polyester Film	741300900
C1, 11	100P	125V	Polystyrol	741301250
C2, 12	470P	125V	Polystyrol	741301670
C105, 106	4700P	50V	BL	740602260
C112, 409	47μ	25V	EPT	741009930
C402, 403	100μ	16V	EPT	741008120
C401, 404, 405	47μ	25V	EPT	741008100
C406, 407	6.8μ	160V	EPT	741200140
C408	4.7μ	315V	EPT	741009350
- Diodes -				
D101, 102	Snap off	1S1855	(NEC)	740403620
D401, 402, 403, 404	Silicon	1S953	(NEC)	740401720
- Jack Connectors -				
J101, 102, 103, 104	27-9		(Amphenol)	745002800
J105, 106	126-013		(Amphenol)	745003400
J403, 404	17-10090		(Amphenol)	745002800
J1, 2, 3, 4, 11, 12, 13, 14				745002930
- Plug Connectors -				
P1, 2, 3, 4 11, 12, 13, 14	N-102P			745002940
P408				745002140
- Resistors -				
R102	470 ohm	1/2W		742410120
R101	100	1/2W		742410200

Circuit No.	Description		Iwatsu Cord No.
R423, 424	200 ohm	1/2W	742410270
R104,112, 114	470	1/2W	742410360
R103, 416, 417	1 K	1/2W	742410440
R453, 453	1.2 K	1/2W	742410450
R106, 401, 403	4.7 K	1/2W	742410580
R119, 120, 126, 127	15 K	1/2W	742410690
R121, 128	30 K	1/2W	742410760
R130, 132	47 K	1/2W	742410810
R457, 458	10 K	1/2W	742410660
R112, 129	75 K	1/2W	742410860
R153	100K	1/2W	742410890
R117, 124	150K	1/2W	742410930
R116, 123	1 M	1/2W	742411130
R109	10 K	1W	742420520
R110, 111	30K	2W	742430670
R104, 105	47 ohm	1/4W Solid	742440020
R136, 137	200	1/4W Solid	742530370
R134, 135, 167, 168	10 K	1/4W Solid	742531160
R131, 133	47 K	1/4W Solid	74253410
R163, 166	100K	1/4W Solid	742531290
R164, 165	200K	1/4W Solid	742531340
R150, 152, 160, 162	1K	1/8W	742110200
R147, 157	1.8K	1/8W	742110280
R148	2K	1/8W	742110270
R158			
R149	3.2K	1/8W	742110260
159			
R151	4K	1/8W	742110250
161			
R144	5K	1/8W	742110240
154			
R146	6K	1/8W	742110230
156			
R145	10K	1/8W	742110220
155			
R203	2K ohm	Var (GAIN ADJ.)	743220130
206	2K	Var (GAIN ADJ.)	
R113	5K	Var (D101 BIAS ADJ.)	743220150
115	5K	Var (D102 Bias Adj.)	
R410	100	Var (DC BAL.)	743220010
413	100	Var (DC BAL.)	
R142	50K	Var (DC BAL.)	743220280
143	50K	Var (DC BAL.)	
R108	20K	Var (BIAS ADJ.)	743260080
R404	2K with switch	Var (Variable)	743252250
407	2K with switch	Var (Variable)	
R118	50K //50K	Var (Vertical Position)	743252250
125	50K //50K	Var (Vertical position)	

Circuit No.	Description		Iwatsu Cord No.
R138	10K ohm	Var (Bias Adj.)	743491390
139	10K	Var (Bias Adj.)	
R140	1 K	Var (Trig Gain Adj.)	743491380
141	1 K	Var (Trig. Gain Adj.)	
	- Switches -		
S1	Mode SW	(FS-22737)	744315662
S2	Sensitivity SW.	(SF-22335)	744315650
S3			
S4	Smoothing	(FS-17466 2)	744313342
5			744313342
S6	Polarity Slide SW.		744400190
7			744400190
S8	Push Auto, - Trig. - Select		744401480
	- Terminals -		
TB103			745100148
104			745100148
	- Transistors -		
TR101	Si Avallanche Transistor NS-2352 (NS)		740303480
TR102	Si PNP 2SA495 G -Y	(Toshiba)	740303880
103			740303880
	- Neon tube -		
NE101, 102	NE-2		740201100

LOW FREQ. AMP. AND STRETCHER

- Capacitors -

C10	47P	500V	Ceramic	740500540
C8	100P	125V	Polystyrol	741301240
C11	470P	125V	Polystyrol	741301670
C4	0.001μ	50V	Polyester Film	741302400
C1, 2, 5, 9	0.001μ	50V	Polyester Film	741302430
C6, 7	0.1μ	50V	Polyester Film	741302390
C4	33 μ	25V	EPT	741009970

Circuit No.	Description			Iwatsu Cord No.
		- Diodes -		
D1, 2	Silicon	1S1544	(NEC)	740403630
D3	Zener	RD29A	(NEC)	740402060
D4, 5	Silicon	1S953	(NEC)	740401720
		- Resistors -		
R9	100 ohm	1/2W		742410010
R2, 5	100	1/2W		742410200
R10	200	1/2W		742410270
R22	300	1/2W		742410310
R31	470	1/2W		742410360
R27, 30	510	1/2W		742410370
R28, 29	820	1/2W		742410420
R6, 13	1K	1/2W		742410440
R24	2K	1/2W		742410490
R1, 3, 4, 7 8, 14, 18	4.7K	1/2W		742410580
R11, 16, 17, 21	10K	1/2W		742410660
R15, 20	20K	1/2W		742410720
R26	47 ohm	1/2W		742410120
R23	15K	1W		742420560
R25	47K	1W		742420680
R12	5K	Var (F.B. Gain Adj.)		743491350
R19	5K	Var (DC, Bal. Adj.)		743491360
		- Pulse Trans -		
T1	FS-17475			744730062
		- Transistors -		
TR5, 6	Silicon	2SC154C	(Hitachi)	740304000
TR1, 2, 3	Silicon	2SC183-Q	(NEC)	740302400
TR4	J-FET	2SK12(Y)	(Toshiba)	740302920
		SAMPLING HEAD		
		- Capacitors -		
C1				
C8	10μ	25V	EPT	741003030
C9	33μ	10V	EPT	741008230

Circuit No.	Description			Iwatsu Cord No.
C4	1μ	10V	EPT	741200150
C5	0.01μ	50V	Polyester Film	741302430
C6, 7	0.001μ	50V	Polyester Film	741302400
C2	1000PF	25V	BL	740602420
C3	4700PF	25V	BL	740602350
		- Diodes -		
D5	Zener	RD-9A	(NEC)	740400840
D1, 2	Ga As	V612	(NEC) Special	740403970
D3, 4	Snap off	1S1857	(NEC)	740403950
		- Jack Connectors -		
J3, 4, 5, 103 or 104	27-7		(Amphenol)	745002810
		- Connectors -		
P1, 2	APC-7		(Amphenol)	745003370
P3, 4, 5	27-9		(")	745002800
P105 or 106	126-012		(")	745003390
		- Transistors -		
TR3	Silicon	2SC183-Q	(NEC)	740302406
TR1, 2	FET	3SK23-BL	(Toshiba)	740304150
		- Resistors -		
R20	100 ohm	1/4W		742440030
R17	470	1/4W		742440400
R4	2K	1/4W		742440060
R13, 14	3K	1/4W		742440320
R5, 18, 19	4.7K	1/4W		742440420
R3	47K	1/4W		742440130
R8, 11, 12	100K	1/4W		742440180
R9	270	1/2W		742410300
R15, 16, 21	47	1/8W	(Allen Bradley)	742610230
R2	4.7K	1/8W	(")	742610300
R1	50	1/50W	(Special)	742730340

OPERATIONAL AMP

Circuit No.	Description			Iwatsu Cord No.
		- Capacitors -		
C1, 2	100Pf	125V	Polystyrol	741301250
C3, 4	100μ	10V	EPT	741003160
		- Resistors -		
R9, 20, 30, 42	100 ohm	1/2W		742410200
R11, 32	300	1/2W		742410310
R6, 27	470	1/2W		742410360
R2, 23, 42, 45	1K	1/2W		742410440
R7, 28	2K	1/2W		742410490
R10, 21, 31, 41 53, 58	4.7K	1/2W		742410580
R3, 5, 8, 10 15, 16, 19, 24 26, 29, 36, 37 39, 46, 48, 49, 51	10K	1/2W		742410660
R11, 32	47K	1/2W		742410810
		- Switch -		
S1, 2, 3, 4	SM-12		Relay	744500640
		- Transistors -		
TR5, 6, 13, 14 17, 18	Silicon	2SC640-L	(NEC)	740302870
TR4, 8, 12, 16, 20	Silicon	2SC183-Q	(NEC)	740302400
TR3, 7, 11, 15, 19	Silicon	2SA495 G -Y	(Toshiba)	740303880
TR2, 9, 10	FET	2SK12- Y	(")	740302920

HORIZONTAL DEFLECTION AMP & BLANKING

		- Capacitors -		
C4	0.001μ		Polyester film	741303450
C6	0.01μ		Polyester film	741303460
C5	0.1 μ		Polyester film	741302390
C3	470P		Polystyrol	741301670
C1, 2	100 μ	10WV	EPT	741003160

Circuit No.	Description			Iwatsu Cord No.
		- Diodes -		
D1, 2, 3, 4	Silicon	1S953	(NEC)	740401720
		- Resistors -		
R26, 27	47 ohm		1/2W	742410120
R25	100		1/2W	742410200
R5, 12, 19	200		1/2W	742410270
R21	470		1/2W	742410370
R15	510		1/2W	742410370
R4, 8, 10, 16	1 K		1/2W	742410440
R7, 9, 14	2 K		1/2W	742410490
R13	3 K		1/2W	742410530
R1, 3, 6, 11 20, 23, 25	4.7 K		1/2W	742410580
R2	1 K ohm		Var (DC Bal.)	743491360
R18	2 K		(H. Gain)	743491370
		- Pulse Trans -		
T1	FS-17476			744730042
T2	FS-22746			744730500
		DUAL TRACE		
		- Capacitor -		
C1	470PF		Polystyrol	741301670
C8	470PF		Polystyrol	741301670
C6	100PF		Polystyrol	741301250
C7	100PF		Polystyrol	741301250
C2	0.01 μF		Polyester film	741302430
C3	0.91 μF		Polyester film	741302430
C4	0.01 μF		Polyester film	741302430
C5	0.047 μF		Polyester film	741302010
C9	33 μ	10V	EPT	741008230
C10	33 μ	10V	EPT	741008230
		- Resistor -		
R1	200 ohm		1/2W	742410270
R2	200		1/2W	742410270
R20	200		1/2W	742410270

Circuit No.	Description		Iwatsu Cord No.
R21	200 ohm	1/2W	742410270
R30	200	1/2W	742410270
R31	200	1/2W	742410270
R36	200	1/2W	742410270
R37	200	1/2W	742410270
R9	510	1/2W	742410370
R42	510	1/2W	742410370
R12	1 K	1/2W	742410440
R13	1 K	1/2W	742410440
R16	1 K	1/2W	742410440
R17	1 K	1/2W	742410440
R5	1 K	1/2W	742410440
R6	1 K	1/2W	742410440
R38	1 K	1/2W	742410440
R39	1 K	1/2W	742410440
R43	1 K	1/2W	742410440
R44	1 K	1/2W	742410440
R8	2 K	1/2W	742410490
R22	2 K	1/2W	742410490
R23	2 K	1/2W	742410490
R26	2 K	1/2W	742410490
R27	2 K	1/2W	742410490
R28	2 K	1/2W	742410490
R29	2 K	1/2W	742410490
R41	2 K	1/2W	742410490
R7	3 K	1/2W	742410530
R10	3 K	1/2W	742410530
R46	3 K	1/2W	742410530
R3	4.7K	1/2W	742410580
R4	4.7K	1/2W	742410580
R18	4.7K	1/2W	742410580
R19	4.7K	1/2W	742410580
R32	4.7K	1/2W	742410580
R33	4.7K	1/2W	742410580
R34	4.7K	1/2W	742410580
R35	4.7K	1/2W	742410580
R11	10K	1/2W	742410660
R14	10K	1/2W	742410660
R15	10K	1/2W	742410660
R24	20K	1/2W	742410720
R25	20K	1/2W	742410720

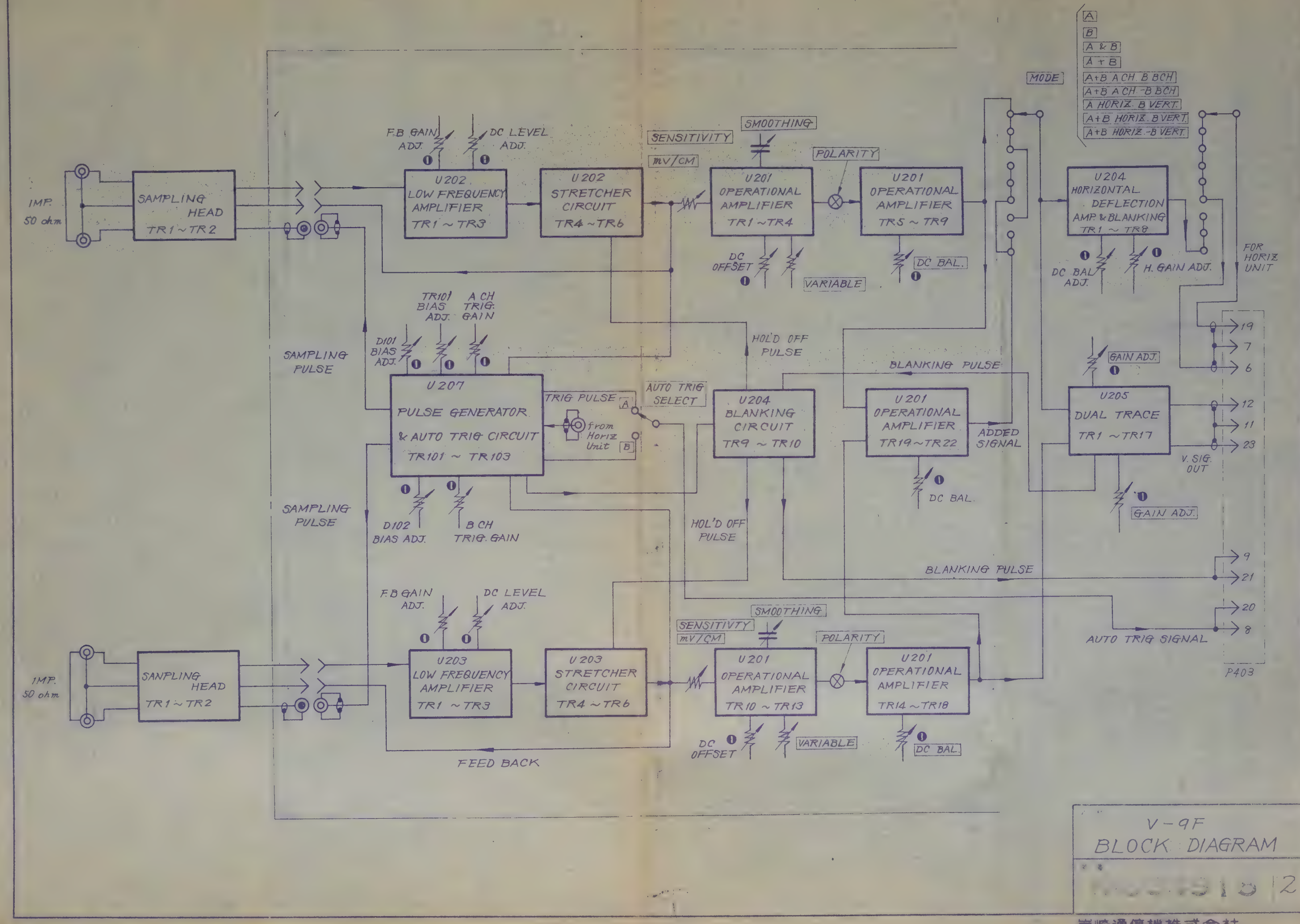
- Transistor -

TR1	2SC183-A	(NEC) Si	740302400
TR2	2SC183-Q	(NEC) Si	740302400
TR3	2SC183-Q	(NEC) Si	740302400

Circuit No.	Description			Iwatsu Cord No.
TR4	2SC183-Q		(NEC) Si	740302400
TR5	2SC183-Q		(NEC) Si	740302400
TR6	2SC183-Q		(NEC) Si	740302400
TR7	2SC183-Q		(NEC) Si	740302400
TR8	2SC183-Q		(NEC) Si	740302400
TR9	2SC183-Q		(NEC) Si	740302400
TR10	2SC183-Q		(NEC) Si	740302400
TR12	2SC183-Q		(NEC) Si	740302400
TR13	2SC183-Q		(NEC) Si	740302400
TR14	2SC183-Q		(NEC) Si	740302400
TR15	2SC183-Q		(NEC) Si	740302400
TR16	2SC183-Q		(NEC) Si	740302400
TR17	Silicon	2SA495 G -Y	(Toshiba)	740303880

- Diodes -

D1	Silicon	18953	(NEC)	740401720
D2	Silicon	18953	(NEC)	740401720
D3	Silicon	18953	(NEC)	740401720
D4	Silicon	18953	(NEC)	740401720
D5	Silicon	18953	(NEC)	740401720
D6	Silicon	18953	(NEC)	740401720
D7	Silicon	18953	(NEC)	740401720
D8	Silicon	18953	(NEC)	740401720



V-9F
BLOCK DIAGRAM

岩崎通信機株式会社

SAMPLER PCB
U206

SAMPLING HEAD

SIGNAL INPUT

APC-7

APC-7

SH1

D1

D2

D3

D3.B

D1.B

R1 50 1/50W

C2 1000P (BL)

C1 10P

R2 4.7K 1/8W

R3 47K

R4 2K

R5 2K

R6 5K

D1 ADJ.

R7 5K

D3 ADJ.

R8 100K

D5 RD9A

R20 100

R13 3K

TR1 3SK23-BL

C5 220PF

R21 1/8W 47

R23 50

R11 100K

R15 1K 1/8W

C10 0.001

TR3 2SC183-O

R12 100K

R16 1K 1/8W

C6 470PF

R17 470

R18 4.7K

R19 4.7K

C9 33μ 10V

TR2 3SK23-BL

R14 3K

C7 470PF

C8 10μF 25V

+20V

OUT

-10V

+100V

FB

SR

R9 270

R10 1K

D4 ADJ.

C4 1μF 10V

C3 4700P(BL)

D4 SRD

RZ2 24

(27-9)

(27-7)

W3

SHORT PULSE SHAPER SPS1

DPS1 DIODE PULSE SHAPER

※ SELECTED

SAMPLED OUT

FEED BACK

W1 OR W2

P105 OR P106

J105 (ACH) OR J106 (BCH)

B +20V

E

F

TO U202 OR ※X U203

C -10V

H +100V

J

A

D K

J103 OR J104 (27-7)

TO PULSE GENERATOR (PT101)

名称	V-9F
	SAMPLING HEAD
	K-[illegible]216

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FROM ACH SAMPLING HEAD

W1

P101 J101 DK H C B J A E F

+100V +100V -10V +20V

POSITION R118a 50K R118b 50K R119 15K R120 15K -100V

P4 J4 4 3

VERNIER

-20V +10V -10V

1 2 3 4 5 16 6 7

U202 ACH 20W FREQ AMP & STRETCHR

SIGNAL OUT

TB101 TR103 GND

P4 8 7 J4

B

SENSITIVITY mV/CM

P2 6 5 J2

R114 5KF AF5
R145 10KF AF4
R146 6KF
R147 7.8KF AF3
R148 2KF
R149 3.2KF AF2
R150 1KF
R151 4KF AF1 AF6
R152 1KF

P2 J2 3 7 TO U205 OP AMP #Y

P1 J1 J4 P4 B C A B A NE102 NE-2 NE101 NE-2

FF10 FF4 FF8 FF3

R153 100K +100V

+300V -10V

C107 0.01 C108 0.01

R109 10K 1W

R113 5K D101 BIAS ADJ.

R108 20K TR101 BIAS ADJ.

TO H.D AMP & BLANKING #E U204

R110 30K 2W R111 30K 2W R106 4.7K

R112 470

C105 4700P D101 1S1855

W102 (27-7) J102 (27-9) C104 10P R107 470 R103 1K

C102 22P R104 47 1/4W

C103 22P R105 47 1/4W

(27-7) W101 FROM HORIZONTAL UNIT

(27-9) J101 C101 100P R101 100 R102 47

TR101 NS-2352 HEAT SINK

D102 1S1855

C106 4700P R114 470 R115 5K D102 BIAS ADJ.

PULSE GENERATOR

U207

J103 (27-9)

R117 150K R116 1M

AUTO TRIG. CIRCUIT.

R121 30K R122 75K R131 47K

R142 50K BAL ADJ.

R130 47K R138 10K R168 10K R167 10K

R136 100 TR102 2SC640L

C113 0.01 R163 2K S101

-12.6V +10V 18

AUTO TRIG SELECT

S8

P403 8 17 9

#24 #11 #8 #20

S1 MODE

FR11 FR6 FR7 FR1

P11 7 J11

S102

25V C112 47μ R134 2K C109 100P C115 100P R164 2K D103 1S953

C111 0.01 R135 2K C110 100P C116 100P R165 2K 1S953 D104

TR103 2SC640L

R133 47K R137 100 +10V -10V

R166 2K C114 0.01 R170 10K R139 10K R169 10K

SENSITIVITY mV/CM

R154 5KF AF5
R155 10KF AF4
R156 6KF
R157 18KF AF3
R158 2KF
R159 3.2KF AF2
R160 1K
R161 4KF AF1 AF6
R162 1K

P12 J12 6 5 8 7 P14 J14

P12 J12 8 7 TO U205 OP. AMP #B

R128 30K R123 1M R124 150K R129 75K R143 50K BAL. ADJ.

R132 47K

15 14 13 12 11 10

POSITION

P14 J14 4 3

R125a 50K R125b 50K R126 15K +100V R127 15K -100V -100V

VERNIER

+100V -10V +20V

U203 BCH LOW FREQ AMP & STRETCHER

TB102 TB104 GND

SIGNAL OUT

DK H C B J A E F J102 P102

W2

FROM BCH SAMPLING HEAD

V-9F

PULSE GENERATOR & AUTO TRIG CIRCUIT

K-604917 2

吉崎通信機株式会社

(A CHANNEL)

RROM SAMPLING HEAD

P105 J105

TR1 2SC183-Q

TR2 2SC-183-Q

TR3 2SC183-Q

TR4 2SK-12(0)

TR5 2SC154C

TR6 2SC154C

D1 1S1544

D2 1S1544

D3 RD29A

D4 1S953

D5 1S953

T1

F.B. GAIN

DC. BAL. ADJ.

U202

U203

D R J L T.C U

+100V −100V +20V −20V +10V −10V

A N W Z

TO H.D. AMP & BLANKING

#B #C

TO PULSE GENERATOR & AUTO TRIG.(U207) #6

J2 P2

mV/CM

(B CHANNEL)

FROM SAMPLING HEAD

P106 J106

TO PULSE GENERATOR & AUTO TRIG.(U207) #11

#D #E

TO H.D AMP. V BLANKING

※ ADJUST

V-9F

LOW FREQUENCY AMP. & STRETCHER

K-604918 2

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SMOOTHING S4

C1 100P
C2 470P
C3 0.001
C4 0.0022
C5 0.0047
C6 0.01
C7 0.022
C8 0.047
C9 0.1

BR11 BR12 BR1 BR2 BR3 BR4 BR5 BR6 BR7 BR8

ACH VARIABLE R404 CALIB

POLARITY S6 NORM INV

FROM JP #B

TR1 2SK12-(Y)
TR2 2SK12-(Y)
TR3 2SA495G-Y
TR4 2SA183-Q
TR5 2SC640-L
TR6 2SC640-L
TR7 2SA495G-Y
TR8 2SC1830

DC-OFFSET

S1 S2

U201

DC BAL

MODE S1 AF7

AF3 AF9

AF6

TO DUAL TRACE J205 #Y

TO HORIZONTAL DEFLECTION AMP & BLANKING J204 #Y

A+B. ACH B BCH
A+B ACH. -B BCH
A HORIZ. B VERT
A+B HORIZ. B VERT
A+B HORIZ -B VERT

TR9 2SK12-(Y)
TR10 2SK12-(Y)
TR11 2SA495G-Y
TR12 2SA183-Q
TR13 2SC640-L
TR14 2SC640-L
TR15 2SA495G-Y
TR16 2SC1830
TR17 2SC640-L
TR18 2SC640-L
TR19 2SA495G-Y
TR20 2SC183-Q

FROM J12 #A

SMOOTHING S5

C11 100P
C12 470P
C13 0.001
C14 0.0022
C15 0.0047
C16 0.01
C17 0.022
C18 0.047
C19 0.1

BCH VARIABLE R407 CALIB

POLARITY S7 NORM INV

DC BAL

TO DUAL TRACE J205 #B

V 9F
OPERATIONAL AMP.

岩崎通信機株式会社

HORIZONTAL DEFLECTION AMP.

+10V
R19 200
TR6 2SC183-Q
R20 4.7K
-10V

+10V
R3 6.8K
R2 1K DC. BAL.
R1 4.7K
-10V

+10V
R5 200
TR1 2SC183-Q
R4 1K
R6 4.7K
-10V

+10V
R7 2K
C4 470P
TR3 2SC183-Q
R8 1K
R18 2K
R17 1K
H. GAIN ADJ.

+10V
R9 2K
TR4 2SC183-Q
R10 1K

+10V
R12 200
TR2 2SC183-Q
R16 1K
R11 4.7K
-10V

P1 CD J1
N
AR4
AR10
AR1
P1 J1
7
C
D
8
P 403
#6
#7
#19

Y
FROM J11 #1

BLANKING

+20V
R21 470
TR7 2SC183-Q
R22 1K

T2
C
B
E
D
TO LOW FREQ. AMP & STRETCHER
#E
#F
A CH.
B CH

D1 1S953
D2 1S953
D3 1S953
#21
#9
P403
H
J
R23 4.7K
-10V

+20V
R27 47
D4 1S953
C2 0.01
TR8 2SC183-Q
R26 47
C3 0.1

C1 0.01
R24 4.7K
R25 100
F
T1
TO DUAL TRACE #N
A
K
L
+20V
-10V
FROM PULSE GEN PT 101

+10V
X
C5 100μ 10V
-10V
W
C6 100μ 10V
Z
U204

R13 3K
R14 2K
TR5 2SC183-Q
R15 510
-10V
-10V

名称	V-9F
	HORIZONTAL DEFLECTION AMP. & BLANKING
番号	K-60492

岩崎通信機株式会社

GAIN ADJ.
R453 1.2K
R203 1K
P4
J4
J402
+10V
-10V
C9 30μ 10V
R1 200
FROM J11 #1
R416 1K
(A ch.)
TR1 2SC183-Q
R3 4.7K
C1 470P
TR5 2SC183-Q
TR7 2SC183-Q
R2 200
R4 4.7K
R43 1K
TR3 2SC183-Q
R5 1K
R6 1K
R7 3K
TR9 2SC183-Q
R8 2K
R9 510
P403
R423 200
R424 200
TR11 2SC183-Q
TR12 2SC183-Q
R32 4.7K
R33 4.7K
R30 200
R31 200
D1 1S953
D2 1S953
D3 1S953
D4 1S953
D5 1S953
D6 1S953
D7 1S953
D8 1S953
R26 2K
R27 2K
R28 2K
R29 2K
R20 200
R22 2K
TR15 2SC183-Q
C6 100P
R24 20K
C7 100P
R25 20K
TR16 2SC183-Q
R23 2K
R21 200
R18 4.7K
TR13 2SC183-Q
TR14 2SC183-Q
R19 4.7K
C5 0.047
C3 0.0033
C4 0.0033
TR17 2SA495Ⓖ-Y
BLANKING PULSE TO J204 #J
C2 0.01
R10 3K
R11 10K
R12 1K
R14 10K
R16 1K
R17 1K
R15 10K
R13 1K
U205
S1 MODE
BR8 & BR10
B9
B3
BF2 & BF4
P11
J11
P408
J2
R206 2K
GAIN ADJ.
R454 1.2K
P14
J14
TR8 2SC183-Q
R36 200
C8 470P
TR6 2SC183-Q
TR4 2SC183-Q
R34 4.7K
R44 1K
R36 1K
R39 1K
R37 200
TR2 2SC183-Q
R35 4.7K
FROM J201 #K
R417 1K
(B ch.)
C10 30μ 10V
TR10 2SC183-Q
R40 3K
R41 2K
R42 510

S1 MODE

	C1	CF11	CF10	P1	J1	CR2	CR4	P1	J1
A	+10V			3				5	-10V
B	-10V			4				6	+10V
A & B									
A + B									
A+B ACH. B BCH.									
A+B ACH. -B BCH.									
A HORIZ. B VERT.									
A+B HORIZ. B VERT.									
A+B HORIZ. -B VERT.									

V-9F
DUAL TRACE
K-604921

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A CH. DC BAL. R410 100 R457 10K -20V

A CH LOW FREQUENCY AMP & STRETCHER (U202) J202

HORIZONTAL DEFLECTION AMP & BLANKING (U204) J204

OP AMP (U201) J201

SENSITIVITY S3 mV/CM

B CH. POLARITY S7 INV NORM CALIB R407 2K VARIABLE

MODE S1 A B A&B A+B A+B ACH. B BCH. A+B ACH. -B BCH. A HORIZ. B VERT A+B HORIZ. B VERT A+B HORIZ. -B VERT

S2 mV/CM

A CH. VARIABLE R404 2K

A CH POLARITY S6 INV NORM

GAIN ADJ R454 1.2K R206 2K

R203 2K R453 1.2K GAIN ADJ

CAPACITOR BOARD U208

P403

B CH LOW FREQUENCY AMP & STRETCHER (U203) J203

DUAL TRACE (U205) J205

B CH. DC BAL. R413 100 R458 10K -20V

J403 ACH PROBE POWER SUPPLY -100V +100V -20V +20V -12.6V (EARTH) -10V +10V -12.6V

J404 BCH PROBE POWER SUPPLY -100V +100V -20V +20V -12.6V (EARTH) -10V +10V -12.6V

V-9F

INTERNAL CONNCTION

K-60[illegible]22

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